Erect Posture of the Young Black-billed Cuckoo: An Adaptation for Early Mobility in a Nomadic Species

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The vertical or perpendicular pose of the young Black-billed Cuckoo (*Coccyzus erythropthalmus*) has been suggested to function in concealing the young, implicitly from predators (e.g. Herrick 1910, Bent 1940). F. H. Kennard (*in* Bent 1940: 75–76) gives the following description of a young Black-billed Cuckoo in this pose (see also Fig. 1): "When I parted the branches a trifle, and finding out that he was discovered, he promptly assumed an almost perpendicular position, with his neck stretched out almost unbelievably and his bill almost straight in the air; and there he sat, immovable, with his bill in the air like a bittern, only oscillating a trifle when the branch on which he was sitting was disturbed a little by the breeze." It should be added that the bird's eyes remain open (Fig. 1). This pose differs from the "hunting and alert (to man) posture," which Hamilton and Hamilton (1965: 413) described in adult Yellow-billed Cuckoos (*C. americanus*). In this posture the adult's body is not held perpendicularly and the bill does not point upward. The importance of the erect posture that young cuckoos assume is discussed in the present paper in relation to the mode of post-hatching development exhibited by the genus *Coccyzus*.

I twice observed, in 1977, young Black-billed Cuckoos assuming an erect posture on the forested dune ridge (described by Sealy 1980a, MacKenzie 1982) that separates Lake Manitoba and Delta Marsh, Manitoba. One observation, on 11 June, was of a banded, flightless young about 2 m from the nest it had left 3 days earlier. The second observation was of an approximately 6-week-old young, which could fly, that I mist-netted on 23 July. I banded this young and returned it to willows near the net site. The bird abruptly assumed an erect posture (Fig. 1), which it held until I had backed away more than 10 m from it. It assumed the pose again, this time gradually, when I moved slowly to within 2 m of it. I repeated this sequence 3 more times before the bird flew away. Each time that the bird stood erect, it remained motionless and was concealed. When it relaxed, although somewhat concealed by foliage, it assumed a pose similar to the "alert" posture of adult Yellow-billed Cuckoos (Hamilton and Hamilton 1965). In 1979 a single 9-day-old cuckoo gradually assumed an erect posture, with its eyes open, as it stood on the edge of its nest before departing later in the day. It responded similarly that day to my earlier approach. This observation implies that this behavior develops before the young leave the nest.

Do young cuckoos conceal themselves when they assume this erect pose, i.e. do they visually deceive an observer (Hailman 1977), such as a predator? Curio (1975) pointed out that when a function is ascribed to a particular trait of an organism, e.g. concealment by posing erectly, implicitly the trait enhances fitness. If the erect posture of young cuckoos does indeed reduce their risk of predation, their fitness should be enhanced. Alcock (1979) pointed out that animals that seek concealment should avoid moving abruptly, because predators readily detect movement. The gradual assumption of the erect pose by young Black-billed Cuckoos suggests that it does function to conceal, although it might be expected that its eyes would be closed while adopting the pose, as they are in some adult owls (Bent 1938, Ligon 1968, Catling 1972, Bondrup-Nielsen 1983) and potoos (Borrero H. 1970, Perry 1979). Bondrup-Nielsen (1983) noted four features common to the so-called concealing poses described for several species of nocturnal owls: (1) the posture was upright, (2) the wing nearest the intruder was raised to the bill, (3) the body plumage was appressed, and (4) the lateral crown feathers were expanded. However, he considered that the open eyes, increased exposure of white feathers around the eyes, and the abrupt manner in which some poses were adopted, particularly by *Aegolius* owls, weaken the hypothesis that this pose functions to conceal the owl. James and Nash (1983) reported fledged but essentially flightless Northern Hawk-Owls (*Surnia ulula*) that assumed an upright posture, with their eyes open. These authors believed, as Bondrup-Nielsen did with *Aegolius* owls, that the widely open eyes of the hawk-owls suggested that this pose is not entirely concealing, but perhaps is a "fright" response to a disturbance. They compared this response to screech-owls (*Otus* spp.) that close their eyes to narrow slits when apparently concealing themselves (Walker 1974). Interestingly, James and Nash noted that the upright posture was assumed only by hawk-owls under one month of age, and not by the adults. They raised the possibility that this behavior has been lost among the adult hawk-owls, which are largely diurnal in their habits, in contrast to the nocturnal owls that Bondrup-Nielsen (1983) discussed. James and Nash (1983) believed that the loss of such behavior might be expected if it served to conceal the bird, but that if it were only a fright reaction, the adults also might be expected to assume it.

More observations of young cuckoos are needed to establish whether their dark eyes are always open when the erect posture is adopted. The juvenal and alternate plumages of the Black-billed Cuckoo are

Fig. 1. Young Black-billed Cuckoo in the erect posture, in sandbar willows (*Salix interior*).

concealing (by definition, but this has not been tested) through countershading (Fig. 2). Some feathers on the back and the secondary coverts of the juveniles are light at their tips, but the rectrices lack the white tips that are relatively conspicuous in the adults (see also Parkes 1984).

Young Black-billed Cuckoos, as well as other *Coccyzus* cuckoos, leave the nest when they are remarkably young: at about 7–9 days of age in *C. erythropthalmus* (Herrick 1910, Bent 1940, Spencer 1943) and in *C. americanus* (Preble 1957, Hamilton and Hamilton 1965, Potter 1980), and at about 9 days in the Dwarf Cuckoo (*C. pumilus;* Ralph 1975). Clutches are incubated for 10–13 days (Spencer 1943, Hamilton and Hamilton 1965, Ralph 1975), and hence the developing young, of *C. erythropthalmus* and *C. americanus,* spend only about 17–18 days in the nest. Although the young cannot fly when they leave the nest, they nevertheless move considerable distances by climbing through the vegetation and jumping from branch to branch. Because they are surely vulnerable to predation under these circumstances, the erect posture is presumably adaptive, even after they can fly. The extent of movements by out-of-nest individuals is indicated by one young that left its nest in the ridge forest on 12 or 13 June and was mist-netted about 150 m from the nest on 2 July, and a second young that left its nest on about 16 June and was netted on 1 July, 2.1 km from the nest.

Cuckoos exhibit a relatively nomadic postmigratory phase in spring during which local food resources are appraised and settlement patterns regulated (Hamilton and Orians 1965). They become more numerous during local outbreaks of caterpillars, apparently their preferred food during the breeding season (e.g. Forbush 1927, Clay 1921, Bent 1940, Nolan and Thompson 1975).

I hypothesize that the early departure of young Black-billed Cuckoos permits the adults, accompanied at least initially by their young, to seek food over a greater area, much as precocial murrelets apparently do at sea (Sealy 1976). This behavior may be adaptive to cuckoos because food may be less abundant or more patchily distributed later in the nesting season. The presence of forest tent caterpillars on the forested dune ridge in 1976 and 1977 (see Sealy 1979, 1980b) possibly provided the proximate stimulus, although the evidence was only correlative, that promoted earlier clutch initiation in those years (Sealy 1978) and thus supports the finding of Nolan and Thompson (1975). In 1976, most of the caterpillars in the ridge forest had pupated by the time the young cuckoos left their nests (Sealy 1980b). Mobility of the broods may increase the chances that the adults and young will encounter food, particularly if the food supply fails, as it did in the dune-ridge forest in 1977 (see Sealy 1980b). In this respect, Val Nolan, Jr. (*in litt.* 1978) pointed out to me that it is crucial to know at what age Black-billed Cuckoos begin seeking and acquiring their own food, and whether up to that time the parents split the brood and move (possibly even in different directions), thus using separate foraging areas that are centered around one or more young. Particularly in years when broods of 4 or 5 young are being reared, widespread movement from the nest seemingly would strain the adults considerably (because they must seek and obtain food for each young), unless the young foraged for themselves at an early age (see also Hamilton and Hamilton 1965). In 1977, a color-marked adult cuckoo was last seen on 17 June, carrying food to the vicinity of its nest. The last young had left this nest 4 days ear-

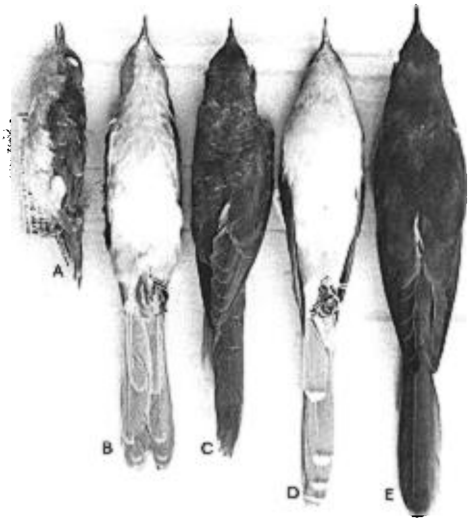

Fig. 2. Black-billed Cuckoos in juvenal plumage: (A) side view (Royal Ontario Mus. 29641); (B) ventral view (ROM 27285); (C) dorsal view (ROM 31, 9, 11, 45). Black-billed Cuckoos in alternate plumage: (D) ventral view (Univ. Manitoba Zool. Mus. 1506); (E) dorsal view (UMZM 1507).

lier. This observation suggests either that the parents and brood moved away from the nest site, or that the parents left the young to forage on their own. In either case, I did not encounter them again. It is interesting to note that during the last few days before activity ceased altogether at this nest (17 June), only one parent was seen carrying food.

Age differences among young Black-billed Cuckoos are more pronounced as brood size increases, and it therefore might be expected that competitive differences among chicks also would be greater. Thus, adult cuckoos might be expected to divide their out-of-nest brood between them. Ferguson and Sealy (1983) found that the reproductive potential of Horned Grebes (*Podiceps auritus*) was enhanced by brood division and parental aggression, which apparently reduced the competitive disparities among chicks that resulted from asynchronous hatching. It remains to be determined whether adult cuckoos split their broods, although my observations, based on color-marked adults, suggest that they may do so.

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A Rapid Procedure for Obtaining Chromosome Preparations from Birds

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Compared with most aspects of ornithological research, cytogenetic studies employing banding techniques have been largely neglected (Shields 1983). A major reason for this is the difficulty of obtaining chromosomal material suitable for C- or G-banding. Tissue culture (Stock and Bunch 1982, Shields 1983) is time consuming and requires extensive laboratory facilities, while blood cultures are not always reliable in providing good harvests of cells (de Boer 1980, de Boer and Belterman 1980). In addition, such *in vitro* techniques are impractical for field use and so are limited to captive birds. Although squash preparations of feather pulp (Shoffner et al. 1967) or embryonic material (Jensen 1975) can be used in the field, they do not provide material suitable for chromosome banding. The present report describes an *in vitro* technique using bird bone marrow that overcomes these problems. This technique represents a modification of the *in vivo* colchicine method (Lu 1969).

The tibia is removed and the nonpink fatty distal portion discarded. With a narrow-gauge syringe needle, the remaining marrow is flushed from the tibia with Eagles medium (C. S. L. Australia) into a 5-ml disposable tube (Falcon, Maryland, USA) and gently homogenized with a 23-gauge needle. To each 5 ml of media-cell suspension, 0.1 ml of a 0.001% colchicine solution is added. This is then incubated at 37°C for 37-42 min. Shorter incubation provides prometaphase cells suitable for G-banding, but these are unsatisfactory for standard or C-banded preparations. Under field conditions it is sufficient for cultures to be incubated close to one's own body for 40 min. After incubation, the culture is centrifuged (manual or battery-operated in the field) for 2 min (800-1,000 rpm) until a pellet forms in the bottom of the tube. Then the supernatant is replaced with a 0.75-M KCl solution. The resuspended pellet is incubated as above for another 20 min and then recentrifuged for 2 min. To conclude, the KCl solution is replaced by fixative (3:1 methanol : acetic acid) and the cell suspension stored indefinitely at 0°C or less. However, the fixative has to be replaced 3 times in the laboratory prior to making slide preparations.

The method presented has several advantages over previously published techniques. With *in vivo* colchicine techniques (Lu 1969) there is limited control over chromosome contraction because the effect of the treatment is influenced by the age, weight, and physiological state of the bird. These problems are eliminated through the *in vitro* procedure, with the result that the preparations are suitable for both unbanded and banded chromosomes (Fig. 1). The *in vitro* method is also readily applicable to field conditions where the majority of birds collected are shot, thereby ruling out *in vivo* techniques. Preparations obtained from freshly killed birds are suitable for G-banding, while standard and C-banded karyotypes can be obtained from birds that have been dead for

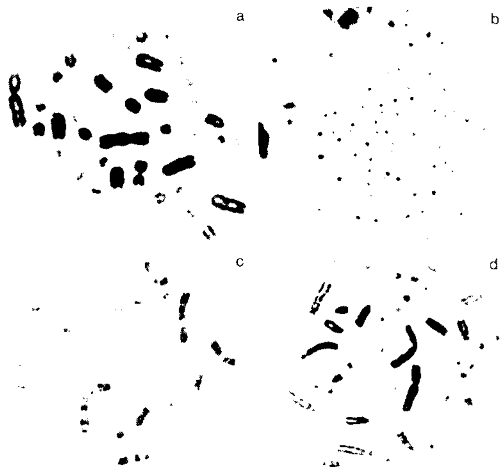

Fig. 1. (a) Giemsa-stained karyotype of *Podargus strigoides* (Caprimulgiformes). (b) C-banded karyotype of a male *Ninox novaesseelandiae* (Strigiformes). (c) G-banded karyotype of a female *Hirundapus caudacutus* (Apodiformes). (d) Giemsa-stained karyotype of a female *Grallina cyanoleuca* (Passeriformes); this bird had been dead for 3 h prior to removal of bone marrow.